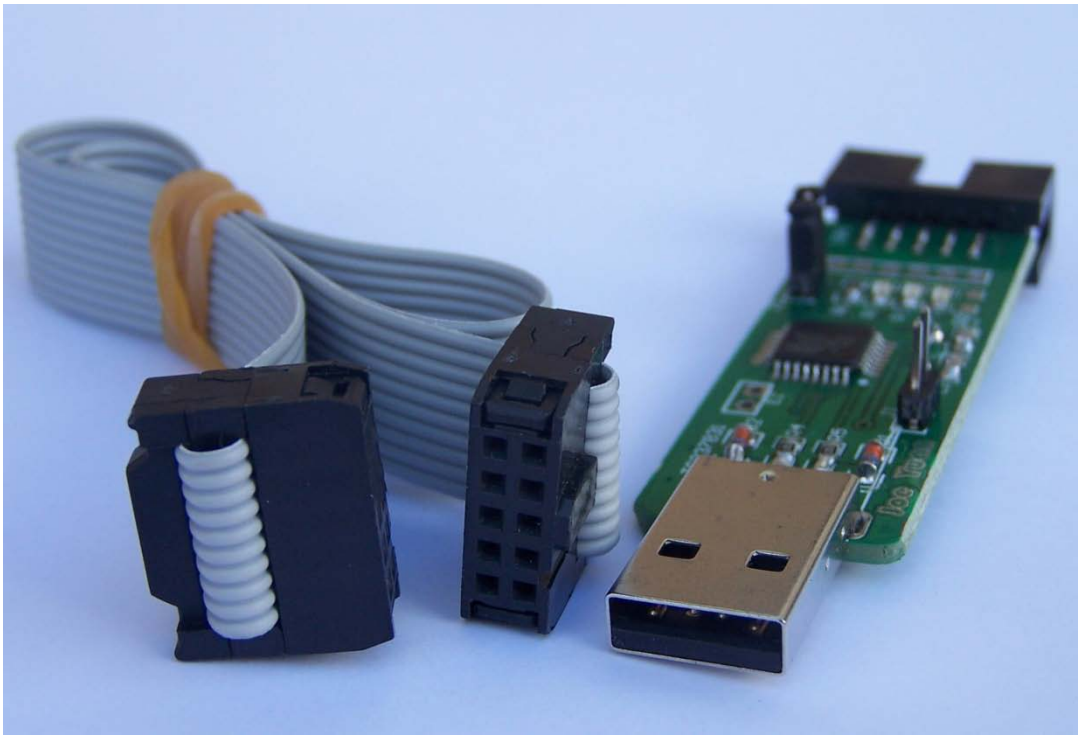
AC-PG-USBASP USBASP AVR Programmer



User Guide

Version 1.1
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AC-PG-USBASP-UG

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1. Overview

1.1. Introduction

USBasp is a USB in-circuit programmer for Atmel AVR controllers. It simply consists of an ATMega8 and a few passive components. The programmer uses a firmware-only USB driver, no special USB controller is needed.

Some of the key features include:

a. Works under multiple platforms. Linux, Mac OS X and Windows are tested,

b. Programming speed is up to 5kBytes/sec, and

c. SCK option to support targets with low clock speed (< 1,5MHz).

1.2. References

1.2.1. Referenced Web Pages

The web pages referenced in this User Guide are listed in Table 1.

Name	Address
USBasp - USB programmer for Atmel AVR controllers	http://www.fischl.de/usbasp/
AVRdude	http://savannah.nongnu.org/projects/avrdude/
AVRdude Documentation	http://www.nongnu.org/avrdude/user-manual/avrdude.html
AVR-USB	http://www.obdev.at/products/avrusb/index.html
WinAVR	http://winavr.sourceforge.net/
MacAVR	http://www.harbaum.org/till/macavr/index.shtml

Table 1. Referenced Documents

1.2.2. Acronyms and Abbreviations

The acronyms and abbreviations utilised in this User Guide are listed in Table 2.

Acronym and Abbreviation	Description
AVR	According to Atmel, AVR stands for nothing, it's just a name. Others say it stands for Advanced Virtual RISC. However, the inventors of the AVR series chips are named Alf Egil Bogen and Vegard Wollan, so you be the judge.
IDC	Insulation Displacement Connector
ISP	In System Programmer
LED	Light Emitting Diode
RISC	Reduced Instruction Set Computing
SCK	Slow Clock
SIL	Single in Line
SPI	Serial Peripheral Interface
USB	Universal Serial Bus

Table 2. Acronyms and Abbreviations

1.2.3. Definitions

The definitions utilised in this User Guide are listed in Table 3.

Term	Definition

Table 3. Definitions

1.3. Supported Microcontrollers

Table 4 lists the microcontrollers that are supported by the USB AVR Programmer.

Supported Microcontrollers			
AT89S8252	AT90S2343(L)	ATMEGA168(V)	ATMEGA649(V)
ATTiny12(L)	AT90S1200(L)	ATMEGA169(V)	ATMEGA6490(V)
ATTiny13(V)	AT90S8515(L)	ATMEGA169P(V)	ATMEGA128(L)
ATTiny15(L)	AT90S8535(L)	ATMEGA32(L)	ATMEGA1280(V)
ATTiny24(V)	ATMEGA48(V)	ATMEGA324(V)	ATMEGA1281(V)
ATTiny25(V)	ATMEGA8(L)	ATMEGA325(V)	ATMEGA2560(V)
ATTiny26(L)	ATMEGA88(V)	ATMEGA3250(V)	ATMEGA2561(V)
ATTiny2313(V)	ATMEGA8515(L)	ATMEGA329(V)	AT90CAN32
ATTiny44(V)	ATMEGA8535(L)	ATMEGA3290(V)	AT90CAN64
ATTiny45(V)	ATMEGA16(L)	ATMEGA64(L)	AT90CAN128
ATTiny84(V)	ATMEGA162(V)	ATMEGA640(V)	AT90PWM2(B)
ATTiny85(V)	ATMEGA163(L)	ATMEGA644(V)	AT90PWM3(B)
AT90S2313(L)	ATMEGA164(V)	ATMEGA645(V)	
AT90S2323(L)	ATMEGA165(V)	ATMEGA6450(V)	

Table 4. Supported Microcontrollers

1.4. Warnings

Some of the components discussed in this document are very sensitive to electrical static discharges. The reader should take precautions to ensure that components are protected against these discharges.

Whilst the voltages typically seen in microcontroller circuits are low, the reader should be aware of the risk of working with electrical circuits and take necessary precautions.

2. Layout

The layout of the USBASP programmer is shown in Figure 1.

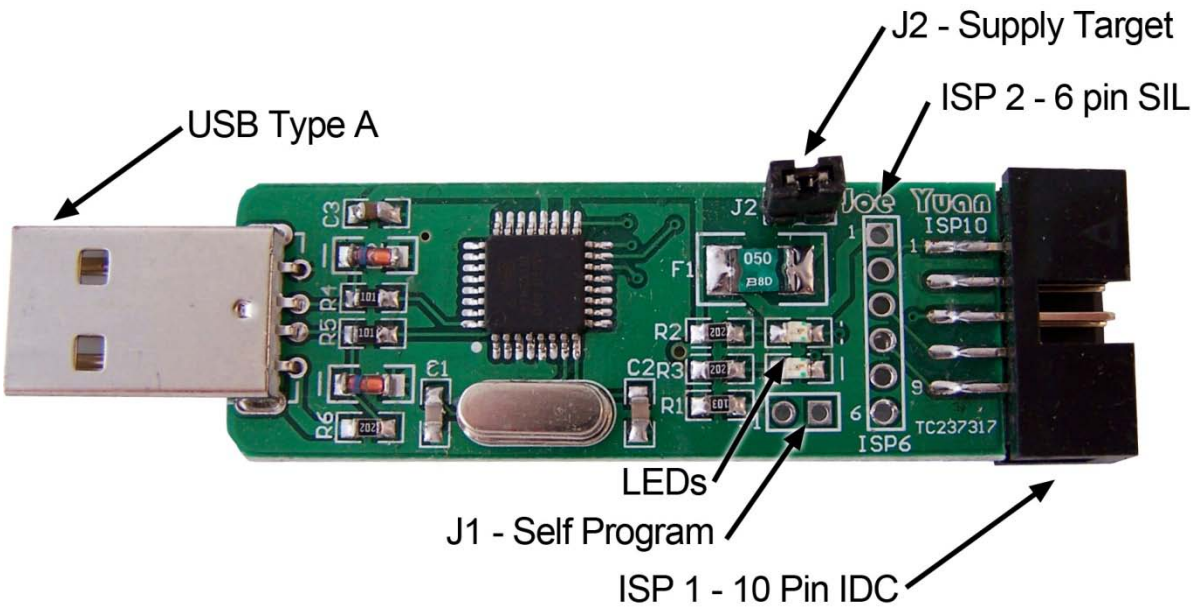

Figure 1. Device Layout

2.1. USB Type A

The USB end of the programmer connects directly into your computers USB port.

2.2. ISP1 – 10 pin IDC

The 10 pin ISP connection provides an interface to the microcontroller. This interface uses a 10 pin IDC connector and the pinout is shown in Figure 2

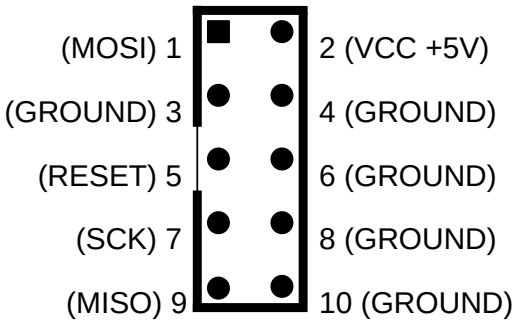

Figure 2. 10 Pin ISP pinout

2.3. IPS2 – 6 pin SIL

The 6 pin ISP connection provides an alternative to the standard 10 pin IDC connector. The board provides 6 holes where a single row header, polarised header or other connector can be mounted. The pinout is shown in Figure 3.

- 1 (VCC +5V)
- 2 (MOSI)
- 3 (SCK)
- 4 (MISO)
- 5 (RESET)
- 6 (GROUND)

Figure 3. 6 Pin ISP pinout

By soldering some single row headers to the underside of the programmer board, you can have the programmer in a form where it can easily be used on a breadboard. This is show in Figure 4 and Figure 5.

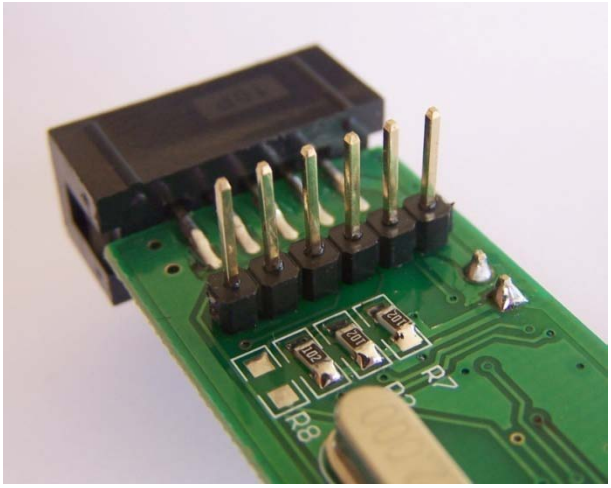

Figure 4. Single row header on underside of programmer board

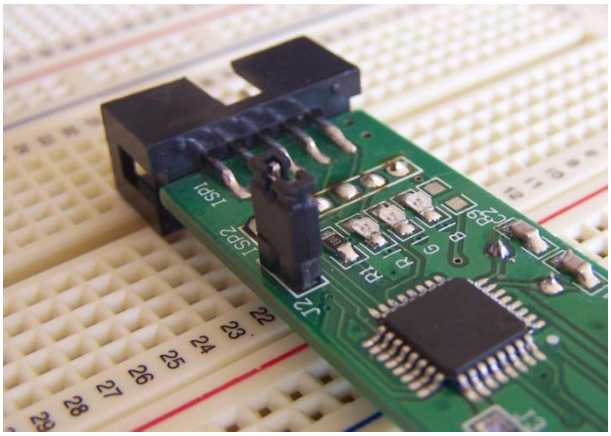

Figure 5. USBASP programmer on breadboard

2.4. J1 – Self Program

This jumper is used to update the firmware of the USBasp programmer. In order to update the firmware you will need 2 programmers. One to be programmed and the other to do the programming.

2.5. J2 – Supply Target

If this jumper is bridged, then +5V supply from the USB port will go tho the target device via the ISP VCC connector. Disable this jumper if the target device has its own power source.

2.6. LEDs

The USBASP programmer has 2 LEDs near the ISP2 connection. These have the following functions:

a. LED 1 – Power

b. LED 2 – Programmer communicating with target device

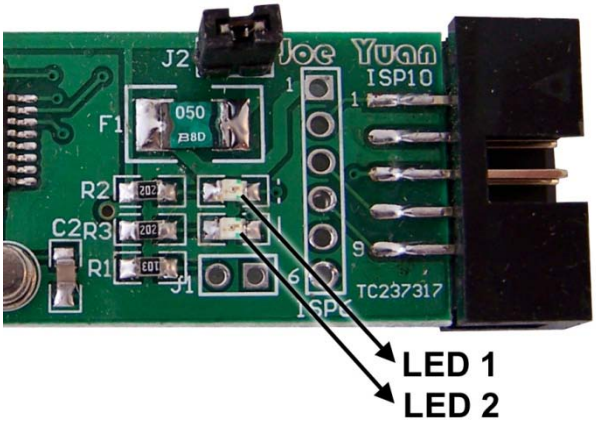

Figure 6. LEDs

3. Using the Programmer

3.1. Connecting the programmer to your computer

Connecting the programmer to your computer comprises of 2 steps:

a. Physically connecting the programmer to the USB port, and

b. Installing drivers in order for it to work.

Whilst the USBasp programmer will work on a wide variety of operating systems, this procedure will focus on Widows Vista 32 bit and Windows XPs

3.1.1. Windows Vista (32 Bit)

3.1.1.1. Required items

Items required to run this procedure are:

a. USBasp programmer

b. Computer with USB port and Windows Vista 32 bit installed

c. USBasp drivers downloaded and unzipped from http://www.protostack.com/download/USBasp-driver-0.1.12.1.zip

3.1.1.2. Assumptions

This procedure assumes that:

a. The logged in user has sufficient permissions to install unsigned device drivers

3.1.1.3. Procedure

To install the USBasp programmer:

a. Insert the programmer into an available USB port

b. When the “Found New Hardware” dialog opens, select “Locate and install driver sotware (recommended)”

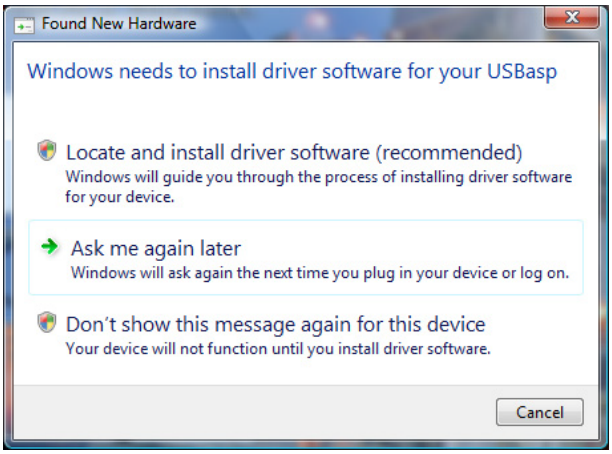

Figure 7. Driver Installation on Vista 32 bit – Found new hardware

c. Wait while Windows Vista attempts to locate a driver

d. When the "Found New Hardware – USBasp" dialog box is displayed, select "I don't have the disc. Show me other options"

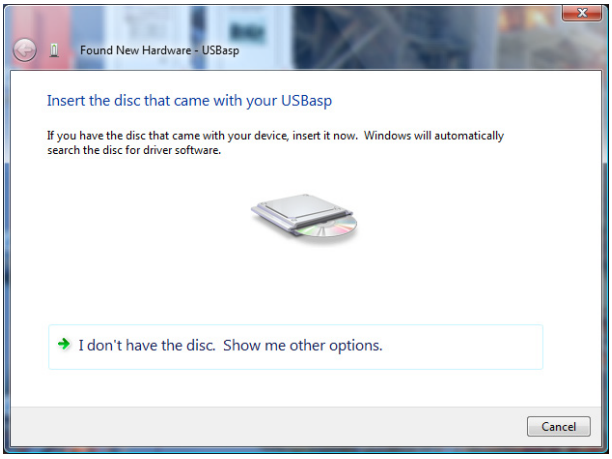

Figure 8. Driver Installation on Vista 32 bit - Found New Hardware – USBasp

e. On the next screen select “Browse my computer for driver software (advanced)”

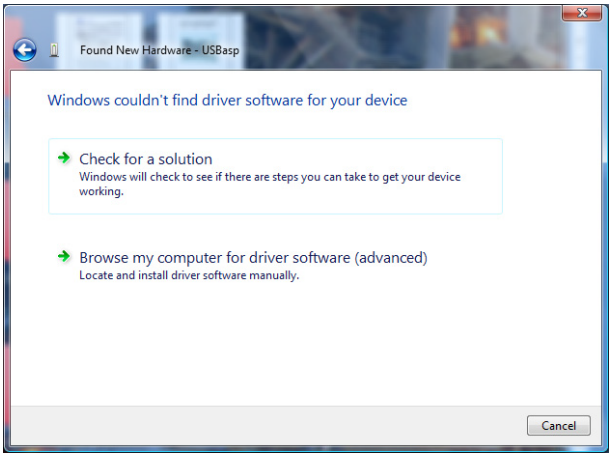

Figure 9. Driver Installation on Vista 32 bit – Windows couldn’t find driver software for your device

f. Click Browse and select the folder where you unzipped the USBasp drivers, then click Next

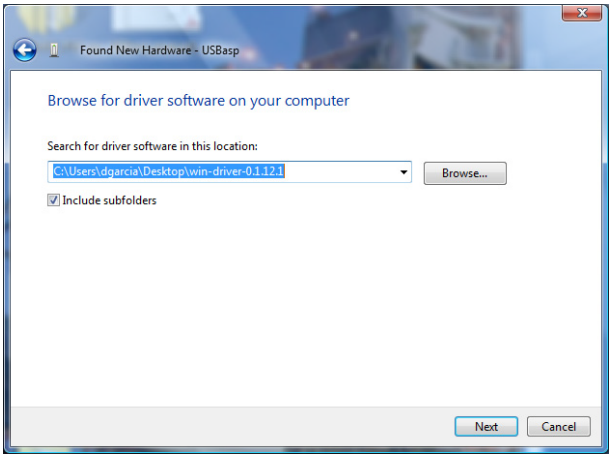

Figure 10. Driver Installation on Vista 32 bit – Browse for driver software

g. When the windows security dialog box is opened, select “Install this driver software anyway”. *Note: This security warning is raised because the device driver files are not signed with a digital certificate. This does not mean that the file will cause a security problem, but rather that windows cannot guarantee it source. Click on “see details” for more information.*

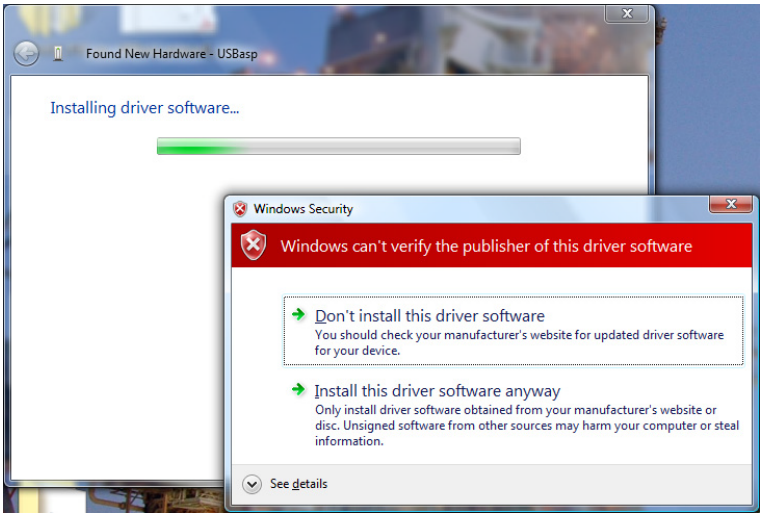

Figure 11. Installation on Vista 32 bit – Security warning

h. When the installation is complete, a confirmation screen will be displayed. Click close to close it.

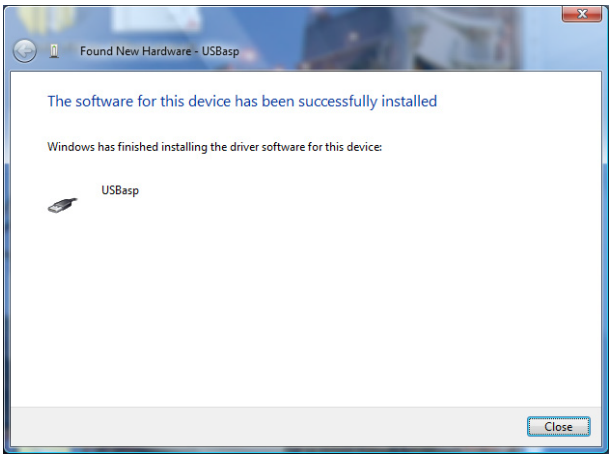

Figure 12. Installation on Vista 32 bit – Confirmation

i. Your programmer is now ready for use

3.1.2. Windows XP (32 bit)

3.1.2.1. Required items

Items required to run this procedure are:

a. USBasp programmer

b. Computer with USB port and Windows XP 32 bit installed

c. USBasp drivers downloaded and unzipped from http://www.protostack.com/download/USBasp-driver-0.1.12.1.zip

3.1.2.2. Assumptions

This procedure assumes that:

a. The logged in user has sufficient permissions to install unsigned device drivers

3.1.2.3. Procedure

To install the USBasp programmer:

a. Insert the programmer into an available USB port

b. When the “New Hardware Wizard” dialog box is displayed, select “No, not this time” then click Next

Figure 13. Installation on Windows XP – New Hardware Wizard

c. On the next page select “Install from a list of specific location (Advanced)” then click Next

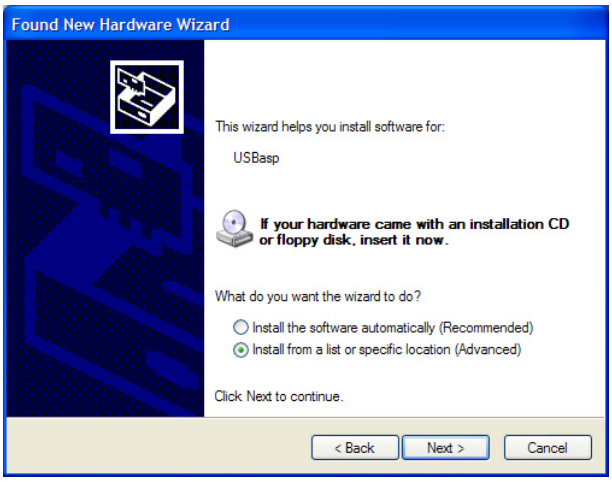

Figure 14. Installation on Windows XP – Insert CD or install from specific location

d. On the Search and Installation options page

(1) Ensure that “Include this location in the search” is checked,

(2) Click Browse and select the folder where you unzipped the USBasp drivers, then

(3) Click Next

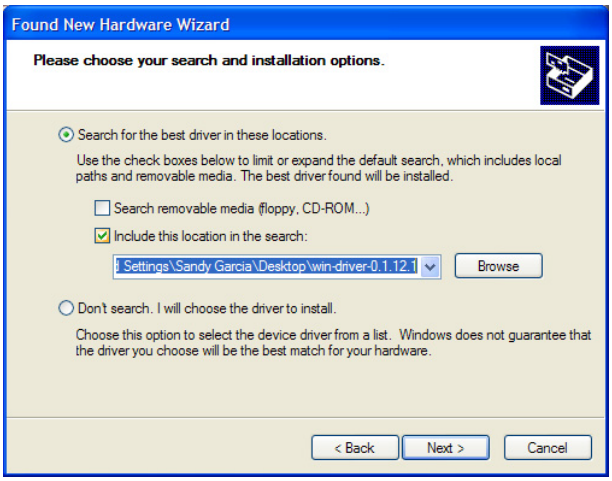

Figure 15. Installation on Windows XP – Specify Location

e. Wait for the driver to install

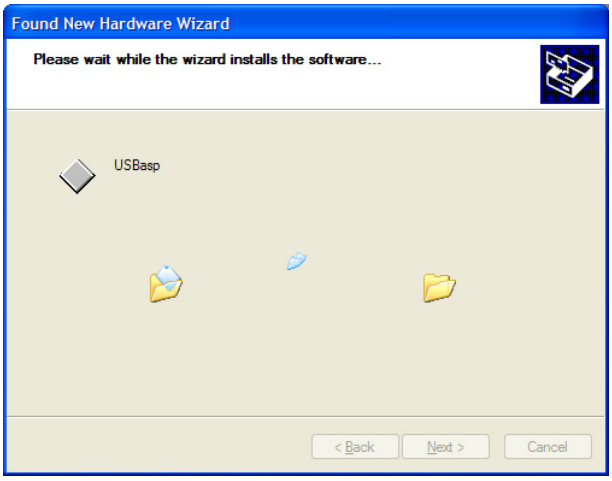

Figure 16. Installation on Windows XP – Driver installation

f. When the installation is complete, a confirmation screen will be displayed. Click close to close it.

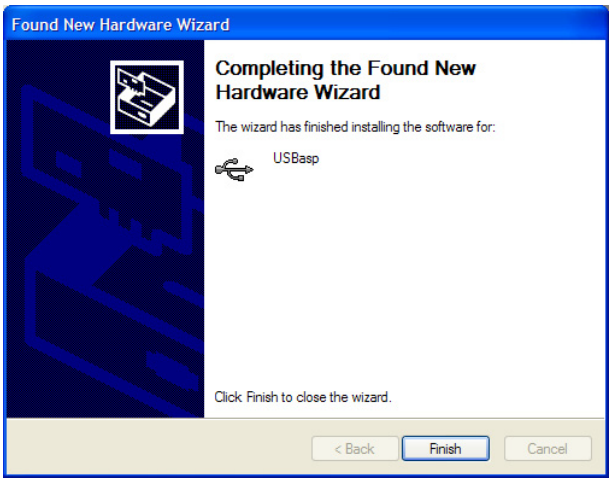

Figure 17. Installation on Windows XP – Installation Confirmation

g. Your programmer is now ready for use

3.1.3. Other operating systems

USBasp works under other operating systems such as Mac OS X and Linux, by drivers are not provided by Protostack nor are installation instructions included in this user's guide.

The USBasp programmer uses the AVR-USB library and driver source code can be downloaded this page http://www.obdev.at/products/avrusb/index.html .

Mac users may also want to look at http://www.harbaum.org/till/macavr/index.shtml .

3.2. Downloading firmware to your microcontroller

3.2.1. Required Items

Item required for this procedure include:

a. USBasp programmer,

b. Computer with USB port and AVRdude software installed,

c. Precompiled firmware to be loaded,

d. 10 pin or 6 pin ISP cable, and

e. AVR Microcontroller with ISP interface wired to it (e.g. an AVR microcontroller on a Protostack 29 pin AVR board)

3.2.2. Assumptions

This procedure assumes that

a. The procedure is being executed on Microsoft Windows XP or Windows Vista,

b. AVRdude is in the path,and

c. USBasp drivers have already been installed.

3.2.3. Procedure

To download the firmware to your microcontroller:

a. Insert the programmer into an available USB port

b. Open a command prompt

c. Enter the following command where

(1) <DEVICE> is the micro controller type you are programming (eg ATMEGA8), and

(2) <FILE> is the filename of the precompiled binary file

```
avrdude -p <DEVICE> -P usb -c usbasp  -U flash:w:<FILE>
```

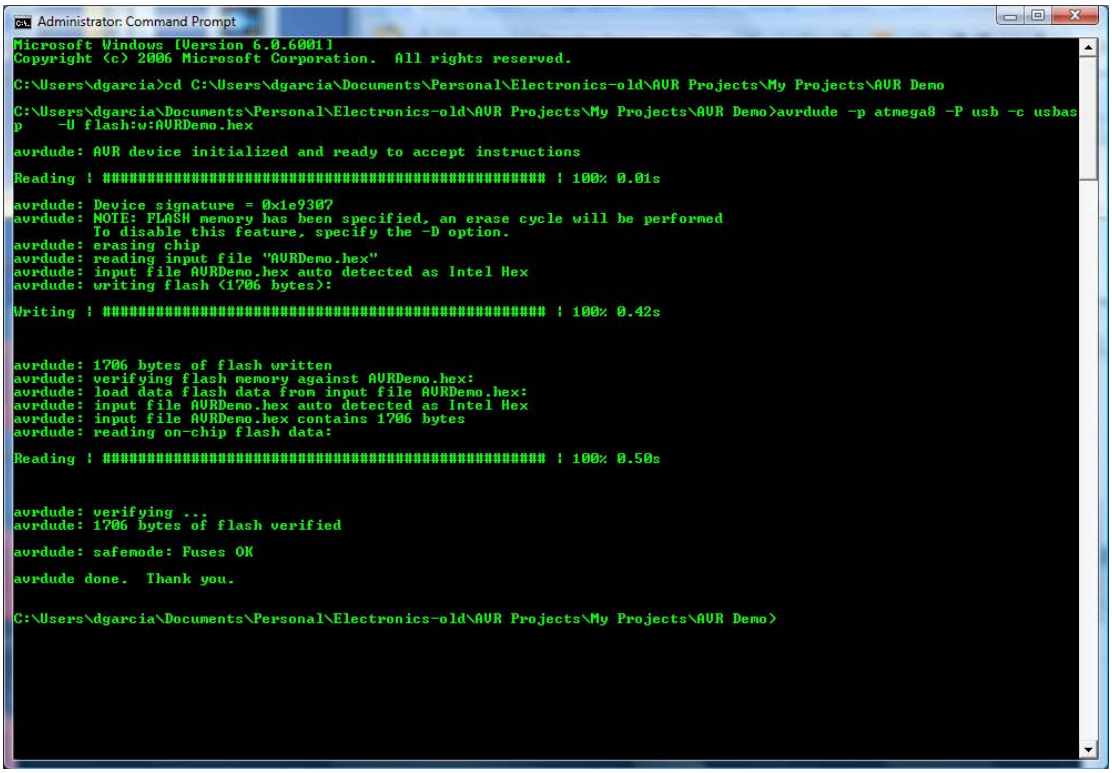

Figure 18. AVRdude writing a flash image to the microcontroller

3.2.4. More information

Please refer to the AVRdude documentation at http://www.nongnu.org/avrdude/user-manual/avrdude.html for more information.

3.3. Upgrading your USBasp

3.3.1. Required Items

Item required for this procedure include:

a. USBasp programmer being programmed (referred to as target programmer)

b. USBasp programmer doing the programming (refereed to as active programmer),

c. Computer with USB port and AVRdude software installed,

d. Precompiled firmware to be loaded (can be downloaded from http://www.fischl.de/usbasp/), and

e. 10 pin or 6 pin ISP cable.

3.3.2. Assumptions

This procedure assumes that

a. The procedure is being executed on Microsoft Windows XP or Windows Vista,

b. AVRdude is in the path,and

c. USBasp drivers have already been installed.

3.3.3. Procedure

To download a new copy of the firmware to a USBasp progammer:

a. Insert the active programmer into an available USB port

b. Enable the J1 jumper on the target programmer

c. Connect the 10 or 6 pin ISP cable from tho active to the target programmer

d. Open a command prompt

e. Enter the following command

```
avrdude -p atmega8 -P usb -c usbasp  -U flash:w:main.hex
```

4. Comment and Questions

If you have any questions or comments regarding this documentation or any of our products, please post to the Protostack forum at http://www.protostack.com/forum/. The forum will allow you to interact with peers and are constantly monitored by our support engineers.